

Marionia kinoi (Nudibranchia: Tritoniidae): A new species from the tropical eastern Pacific

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ABSTRACT

Marionia kinoi, a new shallow water subtidal species of tritoniid nudibranch, is described from the tropical eastern Pacific. Along with a suite of internal characteristics (the number of rodlet rows on the jaw and a distinctively shaped rachidian tooth), its brilliant orange mid-dorsal color pattern, with whitish margins, immediately distinguish this new species from its Indo- and eastern Pacific congeners.

Additional Keywords: Gulf of California, Dendronotacea, Eusebio Francisco Kino

INTRODUCTION

The most recent comprehensive review of Tritoniidae taxonomy was published nearly 50 years ago (Odhner, 1963). Since then, new species descriptions have called into question his system of classification (e.g., Willan, 1988, and Smith and Gosliner, 2003, 2005, and 2007). When Bertsch et al. (2009) described the first species of Tritoniidae known to feed on zoanthid (not alcyonariid) Anthozoa, they presented a preliminary morphological phylogenetic analysis of the family. Their strict consensus phylogeny resulted in an unresolved polytomy of nine species, distributed among four genera (*Marionia*, *Tritonia*, *Tritoniella*, and *Tochuina*), emphasizing the need for further research to understand the evolutionary relationships within this group.

The present paper contributes to our understanding of the biodiversity of the tritoniids, essential for future comparative studies of this clade. There are less than 30 currently accepted species of named *Marionia* world-

wide, with most occurring in the Indo-Pacific (Smith and Gosliner, 2007; Gosliner, Behrens and Valdés, 2008; García and Bertsch, 2009). Adding to the many unresolved taxonomic problems in this group, there are at least another 15 unnamed Indo-Pacific species (illustrated in Gosliner, Behrens and Valdés, 2008) and 2 unnamed eastern Pacific species, *Marionia* sp. 1 and *M.* sp. 2 (illustrated in Behrens and Hermosillo, 2005). Herein we name this *Marionia* sp. 1 from tropical west America.

MATERIALS AND METHODS

The specimens were relaxed in iced water until no response to external stimuli, then fixed in 4% Formalin. Dissection was performed by a dorsal incision through the length of the notum, from the base of the rhinophores to the base of the foot, allowing the removal of the entire visceral mass in one piece. The jaws and the rachula were freed from the buccal mass, and put into 10% KOH solution. They were the rinsed in deionized water, air dried and coated for electron microscopy. Scanning electron micrographs (SEMs) were produced on a Hitachi model S-300D. Drawings were produced with the aid of a drawing tube attached to a stereo microscope. All drawings were digitalized by scanning and then composed and edited for publication using Corel Photoshop™. The holotype and paratype specimens are deposited in the collections of California Academy of Sciences (CASIZ), San Francisco.

SYSTEMATICS

Suborder Dendronotacea Odhner, 1934
Family Tritoniidae Lamarck, 1809

Genus *Marionia* Vayssièrè, 1877

Marionia kinoi new species
(Figures 1–10)

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Marionia sp. 1. Behrens and Hermosillo, 2005*; Hermosillo and Behrens, 2005; Hermosillo, 2006; Hermosillo et al., 2006*; Bertsch, 2010a.

Marionia sp. Camacho-Garcia, et al., 2005*.

* Indicates color photographs of living organisms included

Description: EXTERNAL ANATOMY (Figures 1–2): Lengths of the living specimens were approximately 80mm. The color of the animal is light orange to brownish red, with small light colored tubercles that resemble a reticulate that covers the surface of the dorsum. The sheaths and shafts of the rhinophores are orange, with the apical portions a light brown color. The body is elongate, subquadrilateral, with the largest section 1/3 of the distance to the posterior end of the foot. The oral veil extends beyond the front of the body. There are eight velar papillae on each side on the veil. The velar papillae are arranged in multifid groups, with blunt rounded apices. The body is finely granulated, except for the smooth sole of the foot. The rhinophores overhang from the margin of the notum. The rhinophore shafts are typically tritoniid, with a central clavus surrounded by a series of pinnate projections. The branchial plumes are relatively short. There are 11 plumes per side, with the largest in the middle third of the body. The branchial plumes are divided into four or five branches. The gonopore is located on the right side, at the first third of the body, below and between the 2nd and 3rd branchial plume. The anus is situated below the 3rd branchial plume, at the same height as the gonopore (Figure 2).

DIGESTIVE SYSTEM: The jaws are yellowish brown in color, with a darker, reddish brown masticatory margin. The masticatory margin appears smooth to the naked eye, but scanning electron microscopy reveals the presence of three to four rows of jaw rodlets. The jaw rodlets at the anterior portion present three rows, which continue halfway, where the fourth row begins to project (Figure 3), until the posterior portion where the four rows are separated. The jaw rodlets are slightly conical, resembling a shark jaw (Figure 4). The radula of the paratype is large, with a formula of 45 (35.1.1.1.35) at its broadest point (Figures 5–7). The rachidian tooth is tricuspid, with a base roughly rectangular, and resembles the shape of an



Figure 1. *Marionia kinoi* new species, photo of living specimen at type locality, 16 meters depth.

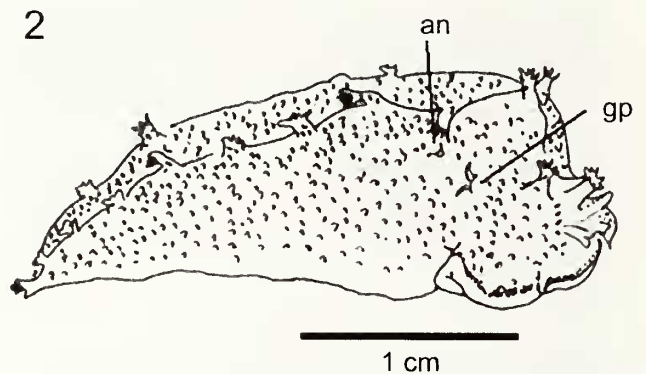
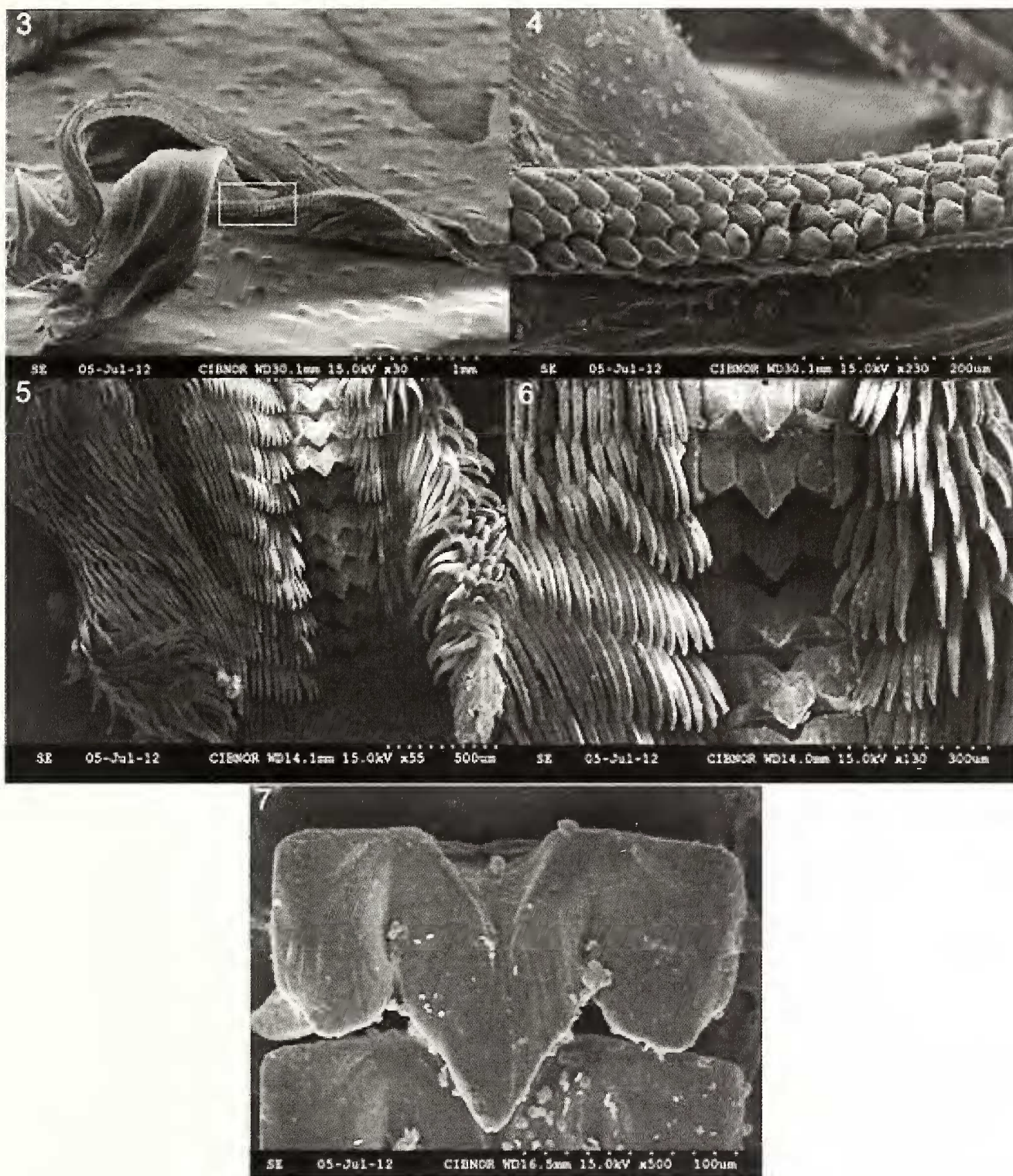


Figure 2. Lateral view of preserved specimen of *Marionia kinoi* new species. Abbreviations: an, anus; gp, gonopore.

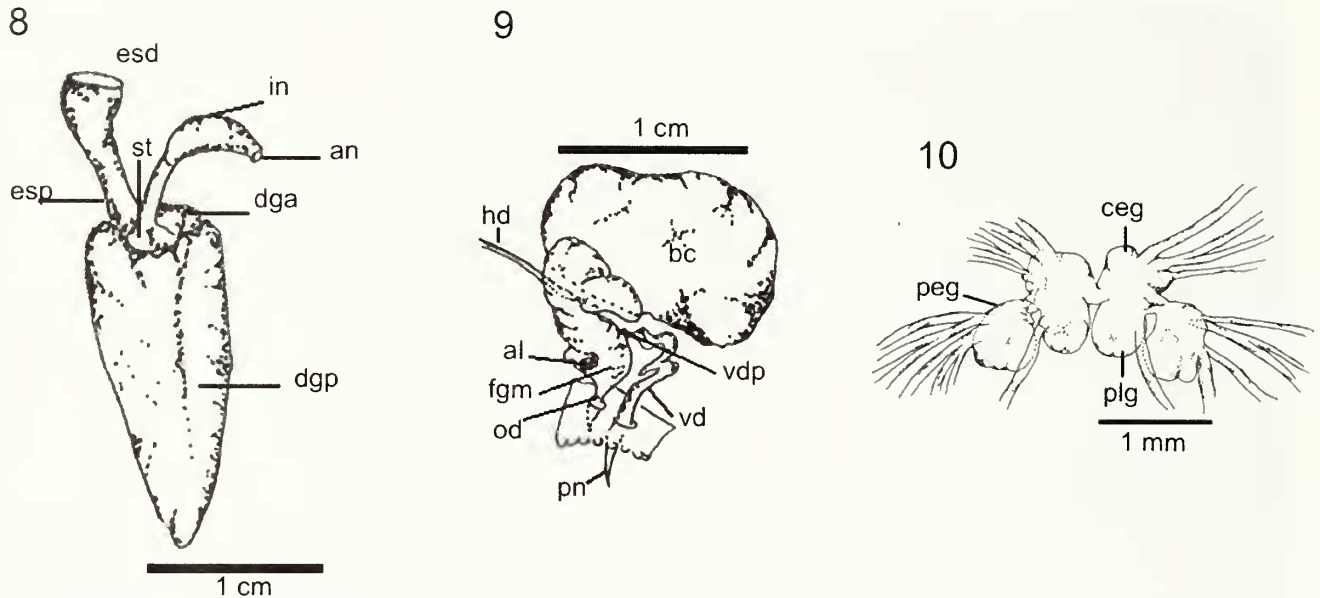
“M” (Figures 6–7). The central cusp is thick, asymmetrical, incised in the shape of a “V,” with a profound canal that begins at the base and fades to the right side of the cusp. The top of the wedge forms two rectangular projecting ridges that present scars along their interior margins. The rows of teeth are arranged very closely together. The first lateral teeth insert at the base of the outer cusp of the rachidian tooth, and are differentiated from the remaining lateral teeth, being more heavily constructed, broader and curved. The remaining lateral teeth are straight to slightly curved, and relatively broad and stout. (Figures 5–6). The esophagus is half the size of the digestive gland, forming a broad straight tube slightly distended at the insertion of the stomach on the ventral side (Figure 8). The stomach is small, less than 0.5 cm in diameter. There are approximately 30–38 subquadrate (slightly more rectangular than square) stomach plates. They are light cream colored, with rounded corners and a smooth surface. The intestine exits the stomach from the anterior left portion, curving up around the anterior portion of the digestive gland towards the right, becoming wider for a portion before abruptly narrowing again to terminate in the anus. The large digestive gland is shaped like a chili pepper. The posterior portion has an anterior hollow that fits around the posterior stomach. The smaller anterior lobe covers the anterior portion of the stomach, and is connected to the posterior digestive gland.

REPRODUCTIVE SYSTEM: A narrow hermaphroditic duct connects to the narrow end of the ampulla (Figure 9). The ampulla is muscular and convoluted, wide and encased by the compact female gland mass. The smaller albumen gland is easily discernible from the membrane and mucus glands. The proximal vas deferens emerges from the female gland mass as a thin, curved tube. The distal portion slightly thickens before entering the base of the conical unarmed penis, lying near the gonopore. The muscular bursa copulatrix is an inflated oval 1.5 cm long. The vaginal duct is short, slightly widening at the vaginal atrium. The oviduct exits the female gland mass and opens to the vaginal atrium.

NERVOUS SYSTEM: The ganglia of the central nervous system sits on the dorsal esophagus, just behind the buccal mass (Figure 10). The central nervous system is symmetrical.



Figures 3–7. SEMs of jaw and radula of *Marionia kinei* new species, paratype CASIZ 190511. 3. Lateral view of the masticatory border, showing the arrangement of jaw rodlets. 4. Detail of jaw rodlets. 5. Eleven rows of the radula, entire half-rows. 6. Closer view of rachidian and lateral teeth (five rows). 7. Close-up of single rachidian tooth.



Figures 8–10. Drawings of internal anatomy of *Marionia kinoi* new species **8.** Visceral mass. **9.** Reproductive system. **10.** Central nervous system. Abbreviations: **al**, albumen gland; **am**, ampulla; **an**, anus; **bc**, bursa copulatrix; **dga**, anterior digestive gland; **dgp**, posterior digestive gland; **esd**, distal esophagus; **esp**, proximal esophagus; **fgm**, female gland mass; **gp**, gonopore; **hd**, hermaphroditic duct; **in**, intestine; **st**, stomach; **od**, oviduct; **pn**, penis; **va**, vaginal atrium; **vd**, distal portion of vas deferens; **vdp**, proximal portion of vas deferens.

The paired cerebral and pleural ganglia are distinct, joined by a short connective. The pedal ganglia are below and on either side of the cerebropleural ganglia, joined by short thick connectives.

Type Material: Holotype: 3.6 cm in length, CASIZ 190509; Paratypes: 3.8 cm length (dissected, CASIZ 190511) and 4 cm in length (CASIZ 190510), all from type locality, 9 March, 2011, Orso Angulo and Jorge Zarate coll.

Type Locality: Two miles south of Punta Arenas, on the Gulf of California coastline east of La Paz, near La Riviera, Baja California Sur, México (23°29'24" N; 109°27'08" W), 16 m depth.

Etymology: The specific name *kinoi* is given in honor of Padre Eusebio Francisco Kino, S.J. (1645–1711), the first Pacific conchologist (Baily, 1935), and intrepid explorer and cartographer of the Californias. His knowledge of the distribution of abalones was crucial for his determination that Lower California was a peninsula, not an island (Bertsch, 2010b). He founded the first Jesuit Catholic mission in the Baja California peninsula at La Paz, which however only functioned from 2 April to 14 July 1683 (Bertsch, 2011); no ruins are known to exist.

Distribution: *Marionia kinoi* new species is known from three eastern Pacific faunal provinces: the Sea of Cortez, Mexican and Panamic (*sensu* Briggs, 1974). It has been reported from the extreme southern portion of the Gulf of California (herein), from Bahía de Banderas, Jalisco/Nayarit (Hermosillo, 2006), Faro de Bucerías, Michoacán, and Ixtapa, Guerrero (Hermosillo and Behrens, 2005),

Costa Rica (Behrens and Hermosillo, 2005), and the Islas Galápagos (Camacho-García et al., 2005).

DISCUSSION

Marionia kinoi new species has been included in the genus *Marionia* because of the number of rows in the jaw (3 to 4) and the presence of stomach plates, in accordance with the division proposed by Odhner (1963). Currently, the genus consists of 23 named Indo-Pacific species (compared and illustrated in Smith and Gosliner, 2007, and Gosliner, Behrens and Valdés, 2008), and five named species in the Atlantic (listed in García and Bertsch, 2009).

This new species can be distinguished readily from other species of *Marionia* based on coloration. For instance, *Marionia cyanobranchiata* (Rüppell and Leuckart, 1828), and *M. platyctenea* (Willan, 1988) have dark green brown or black gills. *Marionia distincta* Bergh, 1905, *M. levis* Eliot, 1904, *M. elongoreticulata* Smith and Gosliner, 2007, and *M. elongoviridis* Smith and Gosliner, 2007, have transverse light or dark lines on the dorsum. Among Atlantic species, the West African deeper-water species *M. vanira* Marcus and Marcus, 1966 has a green body, and the Caribbean *M. tedi* (Marcus, 1983) has a translucent white body and white processes.

Gills situated on a more prominently-thickened basal trunk separate *Marionia kinoi* new species from *M. rubra* (Rüppell and Leuckart, 1828), *M. dakini* (O'Donoghue, 1924), *M. arborescens* Bergh, 1890, and *M. pustulosa* Odhner, 1936.

The known feeding specificity of tritoniids on a single species or small group within a family of Octocorallia (Smith and Gosliner, 2003) reliably distinguishes *M. kinoi* new species from *M. hawaiiensis* (Pease, 1860), which preys on *Anthelia*, and *M. bathycarolinensis* Scott and Gosliner, 2005, a specific predator on *Paracis*. Neither of these prey genera of Octocorallia are known to occur in the Gulf of California (Hendrickx, Brusca, and Findley, 2005).

In addition to these features, there are two external characters that differentiate the plate-bearing tritoniids from our new species: the number of branchial plumes and the number of velar papillae. *Marionia kinoi* new species has 11 pairs of branchial plumes and eight pairs of compound velar papillae. None of the other 20 Pacific and two Atlantic species (contrasted in Table 1, Smith and Gosliner, 2007) has this suite of features. Moreover, the presence of 3 to 4 rows of jaw rodlets and 35 teeth rows distinguish *M. kinoi* new species from these congeners.

This new species differs from the only other known *Marionia* species occurring in the American Pacific; that still undescribed species is smaller in size, and the body, lateral processes, oral veil and rhinophores are white.

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